

Impacts of a Tax Reform on the U.S. Timber Sector

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Abstract

There is increasing discussion in the US Congress of the desirability of reforming much of the US federal tax code. During the last Congress Representative David Camp (R-MI) introduced his tax proposal that seeks to fundamentally reform the tax code by proposing to lower corporate rates while eliminating various tax write-offs and broadening the tax base. This study uses a Timber Supply Model to focus on tax changes that might apply to the timber sector. While our study follows the Camp proposal generally, it does not try to precisely replicate the Camp proposal.

Keywords

Timber, Tax, Reform, Forest, Economy

Introduction

During the last Congress Representative Dave Camp (R-MI) introduced his tax proposal that seeks to fundamentally reform the tax code by proposing to lower rates and broaden the tax base by, among other things, eliminating certain tax expenditures write-offs, preferences and incentives. This study focuses on the impact, compared to the base case, of tax changes that might uniquely apply to the timber sector, including the elimination of the Real Estate Investment Trust (REIT) form of business organization for the timber industry. Most of these changes are incorporated in the Camp proposal.

Early analysis by Quantria (2012) suggests substantial impacts on the forest sector. In addition to the elimination of the timber REIT, these include: A major reduction in timber harvesting, resulting in a loss in sales and jobs in the forest industry; a substantial reduction in active forest management; reduction in investments in forest land in the US, which will result in a restructuring of forest ownership, investments outflows to foreign sites, a decrease in domestic forest products production, an increased US imports of forest products and the reduction of managed forests.

This study, using a different approach from Quantria, confirms these general impacts on the forest industry, but estimates the magnitudes of these changes through time. This study examines the likely magnitudes of the changes in the tax code on the timber producing sector of the US economy from 2015 to 2055. The basic tool used is the Timber Supply Model (TSM). The model provides projections that examine timber harvest levels and other industry variables for the base case with the situation when only the unique timber tax changes are imposed and also when a corporate tax reduction is added to the unique tax changes.

The General Approach

The approach involves two phases. First, we identify the tax changes and business types to which the changes apply, and estimate the tax impacts on the costs of the various business forms. Second, apply the cost estimates to the Timber Supply Model (TSM) under two alternative scenarios to estimate their respective and aggregate effects on timber production and investment levels through time compared to the base case.

Phase 1 identifies and examines the several current private forest ownership forms to determine the anticipated impact of the proposed tax changes on the costs of timber growing in these business forms. The focus is on the

timber resource – the timber stock, harvest, investments and changes in that stock over time. The business forms include the C-Corp, public and private REITs, and proprietorships both large and small. Other business forms are discussed, e.g., partnerships, S-Corps, etc. An estimate is made of the effect on the costs of each type of tax change for a representation business ownership for each type of business form.

Phase 2 applies the various tax changes to the business forms and incorporates these into an adapted version of the Timber Supply Model (TSM) on an area-weight adjusted basis. The basic model incorporates a supply side, which consists of forest lands with various biological yield rates that can be modified by changes in investment and management levels. Superimposed on this system is a demand side that anticipates increasing demand levels though time based on past experience. For this analysis, we also updated the timber inventories to account for differences in ownership type.

The estimates of cost changes associated with each type of tax change are integrated into the appropriate business form in the underlying TSM to project the impacts on investments, production and so forth for the various forest business forms. The model thus captures the effects of timber cost changes associated with the various tax revisions for a typical or representative firm of each type.

The Model

The basic tool used is the Timber Supply Model (TSM), sometimes called the Global Timber Trade Model, which was developed by Sedjo and Lyon (1990) and has been updated, modified and expanded over time (e.g., Sohngen et al. 1999; Daigneault et al. 2012). Additionally, the current variation has been updated based on industry events in the first part of the 21st Century. The model is a forward looking inter temporal optimal control market model that makes forest investments on the bases of expected future demand. The model incorporates all US forestlands, public and private, as well as the relevant biological yield functions. It examines the effect of tax changes on the 342 million acres of private timberlands. Public harvests are unaffected by the tax changes. The approach anticipates long-term increasing demand that puts pressure on prices. The supply side, which consists of forest lands with various ownerships, tree species and biological yields, responds in an economically optimal manner to timber price pressures, current and anticipated, by optimally increasing investments and management levels thereby shifting out the supply function over time. The economically driven supply side responds in an optimum manner to demand, which modestly grows through time. In this present application the model makes projections through 2055. In essence, this approach develops a long-term supply function based on the physical resources and anticipated demand through time. The study compares the projection of the base case with those scenarios incorporating timber and corporate tax changes. All the scenarios anticipate the same rise in harvest demand over time.

Timberland Ownership in the US

The Forest Service defines timberlands as that subset of forestlands that have the biological potential to be capable of producing timber on sustainable commercial basis. This study defines timberlands as any forestland that is managed for commercial timber. In most cases these definitions coincide. Table 1 allocates timberland area into the ownership types considered in this analysis.

TABLE 1: TIMBER LAND OWNERSHIP IN THE US

Public REITS	20 million acres
TIMO/private REITs *	22 million
Large owners**	100 million
Other Family	200 million
-100 million acres	(over \$10 million revenues)
-100 million acres	(under \$10 million revenues)
Total Private:	342 million acres
Public Timberland:	132 million
Total US Timberlands	474 million acres

Source: A number of sources we used to estimate the various land areas involved include: Forisk's Blog (2013, 2014); Butler USFS, www.treesearch.fs.fed.us/pubs/15758, Cindy Mitchell, WFPA, unpublished draft, Feb 2006, and U.S. Forest Inventory and Analysis 2011, American Forest & Paper Association 2010.* The estimates of private TIMOS was made based on discussions with Tracy Evans and drawing from her paper "Not All TIMOs are Alike," T.B. Evans and G.A. Myers, The Consultant 2014.**286 larger owners average 348,000 acres.

More Specifics: The Proposed Tax Changes

The following changes in tax structure and costs are incorporated into the model:

- Repeal of capital gains treatment of timber revenue. The proposal takes the position that timber is not a capital asset but rather an inventory and thus timber income taxed as ordinary income.
- Repeal of the treatment of timber as real property for purposes of the REIT. REITs are a usual business form chosen by many timber owners, investors, and former forest products corporations. Limitation of the REIT for timber ownership would result in these ownerships paying at higher corporate tax rates.
- Restricting of the deduction for timber management and operating costs to taxpayers with less than \$10 million in annual gross receipts. Current law allows most forest landowners to deduct management and operating costs in the year that they are incurred, rather than capitalizing these costs. (IRC Sections 162 and 263A(c)(5)).
- Repeal of the provision allowing most forest owners to deduct up to \$10,000 of reforestation costs annually per qualified timber property stand with costs incurred and amortize remaining costs over 84 months (IRC Section 194); the proposal would require that these costs be capitalized and not claimed until the timber is harvested or sold. (e.g. see Kleinbard op ed., March 9, 2015).
- Reduces corporate income tax to 25% from the current level of 35% and reduce the highest personal income tax rate from 39.6% to 35%.

Initial Conditions

The TSM has been adjusted from earlier applications to internalize recent changes in the timber industry (e.g., Prestemon et al. 2015). These changes include the recognition that although US timberland expanded more than 35 million acres between 1987 and 2012, (USFS 2014), the level of new plantings has fallen sharply reflecting declining demand due in part to the Great Recession and the reduction of U.S. lands favorable to planted forest. This slowdown is consistent with some Forest Service studies (e.g., Wear et al., 2013) that anticipate forest stocks could be lower by 2060. Also, harvests have shown a recent decline and exchange rates are moving against US production, which could affect both domestic and international timber markets. These factors have been incorporated into the model thereby suggesting a less buoyant future than has been the case in the latter part of the 20th Century.

The Results: Intuition

The projections generated by the model in response to higher taxes would be expected to reflect a relative decline in timber investments that continue to be low over time compared to levels that would be expected to occur in the absence of the anticipated tax changes. Associate with domestic harvest declines we would expect a relative contraction of managed timberlands over time, again compared to what it would have occurred with the earlier tax regime, reflecting the comparative decline of investment levels sufficient to maintain the forest stocks at levels consistent with the earlier tax regime.

The Scenarios

Two scenarios are examined in this paper. Each scenario is run against the base case where we have run projections with the current tax structure thereby capturing the existing tax structure so it is consistent with current timberlands performance. Scenario 1 assumes the corporate and state corporate tax rate are unchanged at their current levels, with base federal corporate tax 35% and state corporate tax rates averaging 4%. Scenario 1 also assumes all the new timber tax provisions discussed in section (5) above are applied. Scenario 2 assumes that all the changes of the first scenario are in place but that the tax reform also involves a federal corporate tax reduction

from 35% to 25% and a top personal tax rate that is reduced from 39.6% to 35%.

Results: the Scenarios

Scenario 1: This scenario captures the cumulative effects of the full set of timber tax changes except the corporate and personal tax changes. As discussed, the changes in projections are with respect to the base case that is a continuation of the pre-tax reform situation.

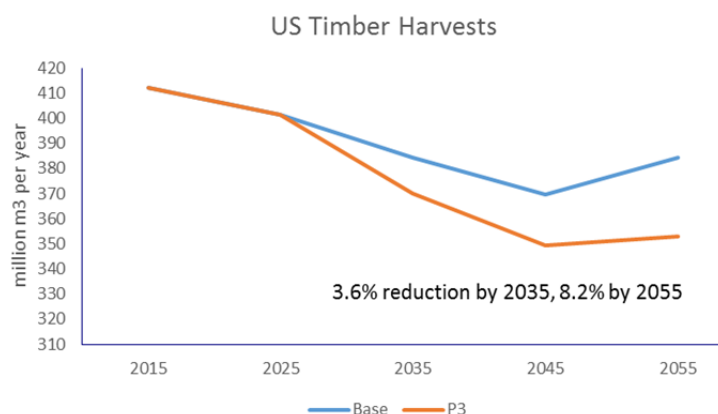


FIGURE 1: US TIMBER HARVESTS SCENARIO 1: REPEAL OF SPECIAL TAX ADVANTAGES FOR TIMBER PRODUCTION



FIGURE 2: TIMBER PRICE CHANGES IN SCENARIO 1

Scenario 1, Figure 1, the basic model (upper line) shows projected timber harvest with the continuation of the current tax regime. Under the current tax regime US harvests are projected to decline roughly 10% between 2015 and 2045 with slight upturn by 2055. When the proposed timber tax changes are introduced into the system, absent a change incorporate tax rates, the projections show a further reduction in harvest of another 8.2% by 2055 for a total decline of about 18% by 2055 (lower line).

Figure 2 shows projections of global timber prices associated with the same set of timber tax increases in the US. Since the US timber market is a subset of the world timber market, prices in the US will adjust in a similar manner to global prices subject to transport costs and any timber trade restrictions. Note that in this scenario timber price projections are essentially the same as what they would be without the tax increases. This result differs from earlier projections (Sedjo and Lyon 1990) that showed a greater divergence of timber prices from the base with new taxes. The reason for this result is that the over the intervening period the US has become a relatively small producer (20%) in the world market, being largely a price taker with foreign competitors quickly filling the decreases in US production. This is also true for the timber prices associated with Scenario 2 below (not shown).

Scenario 2, (Figure 3) with the reduced corporate and personal tax rates superimposed on the higher specific tax rates shows that the effects of the higher tax rates are mitigated somewhat, with timber harvest projected to decline 6.4% by 2055 from the business as usual scenario. However, the total decline is still about 16% from 2015 levels. Thus the effect for the timber industry of the reduced corporate taxes of this magnitude in offsetting the loss of the specific tax advantages in the current system is quite small. Also, timber prices are essentially not affected by the

combination of tax changes for the same reason as in Scenario 1, i.e., foreign producers fill in for US production declines.

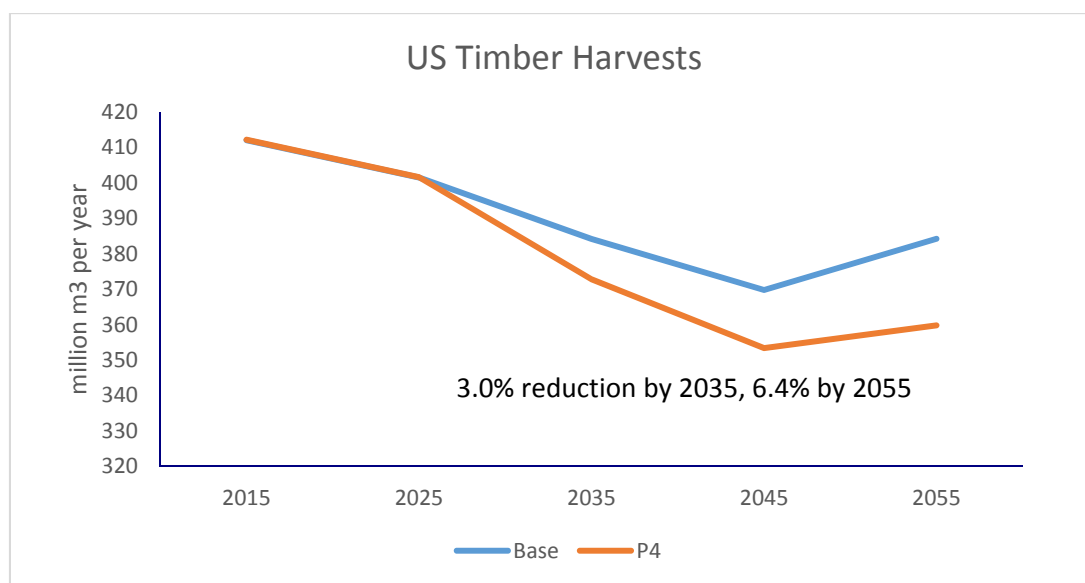


FIGURE 3 SCENARIO 2: IMPLEMENTATION THE CORPORATE AND INDIVIDUAL TAX REDUCTIONS

Discussion: Overall Effects of Reducing the Corporate Tax Rate

The rationale for a tax reform is usually given that the advantages of the lower corporate rate will largely compensate for the loss of the various special tax advantages in the pre-reformed system. Of course, the lower corporate rate affects most if not all the various sectors of the economy in addition to timber. Also, the effects depend critically on the size of the rate reduction. For the timber sector the impact in the resultant outcome depends on the relative size of higher sector taxes due to the lost advantages compared to the positive effect of the reduced corporate taxes. It is clear that for the timber sector the negative effects of an increased in specific timber taxes of the type examined in this study would overwhelm the positive effects of a 10% reduction in the national federal corporate tax together with a reduction of the top individual tax from 39.6% to 35%.

The model also provides a host of other projected outputs from these tax changes including changes in investments levels through time (Sedjo and Sohngen 2015). If the tax reform measures were implemented without the reduction in federal tax rate, the total area in timberlands would be reduced by some 15 million acres between 2015 and 2055. If the reform reduces federal corporate tax rates to 25% together with the individual tax reduction, the projected area of timberlands (managed forest) is still reduced by about 12.5 million acres, between 2015 and 2055, below the level that would obtain if the current tax system should continue. In 2012 US forestland was estimated at 751 million acres of which 521 million are timberlands. This decline in timberland areas is associated with declines in revenues and investment in forestry averaging over \$600 million/year to 2055 (See Table 2 for percentage comparisons). Also, US net imports of wood and wood products would increase by to about 29 million cubic meters though the period and the wood trade deficit would increase to about \$3.6 billion per year by 2055.

TABLE 2: PERCENT CHANGE IMPACTS FROM TIMBER TAX IMPOSITION VS. CORPORATE TAX REDUCTION

Increase in Specific Taxes vs Decrease in Corp & Personal

Introduce New Timber Taxes Scenario 1	Decreased Corp Taxes Scenario 2
<ul style="list-style-type: none"> Timberland area reduction by 2055 -2.3% Reforestation expenditures Initial (2015) -29.4% 2055 -14.0% 	<ul style="list-style-type: none"> Timberland area reduction by 2055 -1.8% Reforestation expenditures initial (2015) -28.0 2055 -9.7%

Summary and Conclusions

This study uses a well-recognized forest sector model to examine the effects on timber production and the timber industry of a comprehensive tax reform similar, but not identical, to that suggested by Congressman Camp. The tax reform involves eliminating some of the tax advantages given to the timber industry while simultaneously reducing the overall corporate tax rate and the highest personal income tax rate. The methodology recognizes that the various business types common in timber production have different tax situations and incorporates the relevant tax changes into the analyses, adjusting for amount of timberland ownership by each business type. Scenario 1 includes all of the specific timber tax changes discussed. Scenario 2 adds a reduction of the corporate tax from 35% to 25% and the reduction of the individual income tax rate to 35% from the current 39.6% to the results of Scenario 1. The basic approach is to use the TSM to compare projections of the future of the timber resource and industry before and after the implementation of the tax changes. The base case (current taxes) is compared with the higher timber tax case without a corporate tax change (Scenario 1). The timber tax system discussed is consistent with discussions underway and would substantially reduce future harvests and the financial returns to the timber producing industry. Then the corporate tax changes are superimposed on the timber tax case to obtain a comparison of the incremental impact of the corporate rate reduction on the revised system (Scenario 2). Although the reduction in the corporate tax has a positive effect on the timber industry compared to Scenario 1, the effect is modest and nowhere near enough to offset the negative tax changes on timber. However, the overall effect of the tax changes would obviously be dependent upon the comparative size of the tax changes.

The effects would be observed in reduced investments over time and would have a continuing negative effect on the area and management intensity of timberlands. This would have, in turn, a negative effect on future harvests. Note that initially harvests would be relatively unaffected, in that the physical stock is minimally reduced in the short-run, but are increasingly diminished through time. Finally, although some temporary disruptions may occur, timber prices would be minimally affected, compared to the base case, both in the short-term and over the longer period, as foreign suppliers would replace US timber in the markets. The replacement of US timber by foreign suppliers will create an increase in the US trade deficit estimated in the model of up to \$4.3 billion by 2055.

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Finally, however, we take full responsibility for this study and for any errors that might remain in the tax representations and interpretations, or in the implications of the economic analysis.

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Appendix: Modified Timber Supply Model

This analysis uses a variant of a well-known dynamic optimization forest management model (Daigneault et al. 2012; Sohngen et al. 1999; Sedjo and Sohngen 2013; Sedjo and Lyon 1990) to examine the effect of a tax reform, which changes the levels of various existing taxes on timber. The model involves the incorporation of a forward-looking forest management projections approach—used increasingly in forestry (e.g., Sohngen et al. 1999; Adams et al. 1996). The model, which uses a discrete time nonlinear optimization approach, is presented below. The model maximizes the net present value of net surplus in timber markets. Net surplus is defined as the area between the timber demand curve and the land rent cost.

This paper modifies the model in Daigneault et al. (2012) by associating specific ownership types with particular forest areas. Additionally, the model has been adjusted to recognize that after 2000 tree planting in the US declined largely to selected replacement. This change has been incorporated into the projections thereby reducing base case levels of future forest stocks. The social planner's problem is to maximize the net present value of consumer's plus producer's surplus for timber harvesting as follows:

For the purposes of describing the model, each of the timber types in the model is allocated into one of three general types of forest stocks. Stocks in type "i" are moderately valued forests, managed in optimal rotations, and located primarily in temperate regions. Stocks "j" are high value timber plantations that are managed intensively. Subtropical plantations are grown in the southern United States (loblolly pine plantations), South America, southern Africa, the Iberian Peninsula, Indonesia, and

Oceania (Australia and New Zealand). Stocks in "k" are relatively low valued forests, managed lightly if at all, and located primarily in inaccessible regions of the boreal and tropical forests. The inaccessible forests are harvested only when timber prices exceed marginal access costs. In this study, forests in inaccessible regions are harvested when marginal access costs are less than the value of the standing stock plus the present value of maintaining and managing that land as an accessible forest in the future.

The forestry model maximizes the present value of net welfare in the forestry sector. Formally, this is:

$$\text{Max} \sum_0^{\infty} \rho^t \left\{ \int_0^{Q^*(t)} \left\{ D(Q_t, Y_t) - C_{H^i}(\cdot) - C_{H^j}(\cdot) - C_{H^k}(\cdot) \right\} dQ(t) - \sum_{i,k} C_G^{i,k}(G_t^{i,k}, m_t^{i,k}) - \sum_j C_N^j(N_t^j, m_t^j) - \sum_{i,j,k} R^{i,j,k}(\sum_a X_{a,t}^{i,j,k}) + CC(t) \right\} \quad (1)$$

$$\text{where } Q_t = \sum_{i,j,k} \left(\sum_a H_{a,t}^{i,j,k} V_{a,t}^{i,j,k}(Z_{a,t}^{i,j}) \right)$$

In equation (1), $D(Q_t, Y_t)$ is a global demand function for industrial wood products given the quantity of wood, Q_t , and income, Y_t . The quantity of wood depends upon $H^{i,j,k}$, the area of land harvested in the timber types in i , j , or k , and $V_{a,t}^{i,j,k}(Z_{a,t}^{i,j})$, the yield function of each plot. The yield per hectare depends upon the species, the age of the tree (a), and the management intensity at the time of planting. As shown below, $m_t^{i,j,k}$ is chosen at the time stands are established and this management intensity sticks with the stand throughout its life in the variable Z . $C_H(\cdot)$ is the cost function for harvesting and transporting logs to mills from each of timber type. Marginal harvest costs for temperate and subtropical plantation forests (i and j) are constant, while marginal harvest costs for inaccessible forests rise as additional land is accessed. $C_G^{i,k}(\cdot)$ is the cost function for planting land in temperate and previously inaccessible forests, and $C_N^j(\cdot)$ is the cost function for planting forests in subtropical plantation regions. $G_t^{i,k}$ is the area of land planted in types i and k , and N_t^j is the area of land planted in plantation forests. The planting cost functions are given as:

$$C_G^{i,k}(\cdot) = p_m^{i,k} m_t^{i,k} G_t^{i,k} \quad (3)$$

$$C_N^j(\cdot) = p_m^j m_t^j N_t^j + f(N_t^j, \sum_a X_{a,t}^j)$$

where $m_t^{i,j,k}$ is the management intensity of those plantings purchased at price p_m^i , p_m^j , or p_m^k . $f(N_t^j, \sum_a X_{a,t}^j)$ is a function representing establishment costs for new plantations. The cost function for establishing new plantations rises as the total area of plantations expands.

The yield function has the following properties typical of ecological species: $V_a > 0$ and $V_{aa} < 0$. We assume that management intensity is determined at planting. The following two conditions hold for trees planted at time t_0 and harvested " a " years later ($a+t_0$) = t_{ai} :

$$\frac{dV^i(Z_{a,t}^i)}{dZ_{a,t}^i} \geq 0 \text{ and } \frac{d^2 V^i(Z_{a,t}^i)}{dZ_{a,t}^i{}^2} \leq 0 \quad (4)$$

The total area of land in each forest type is given as $X_{i,j,k,t}$. $R_{i,j,k}(\cdot)$ is a rental function for the opportunity costs of maintaining lands in forests. The rental function is given as:

$$R(\sum_a X_{a,t}^{i,j}) = \alpha (\sum_a X_{a,t}^{i,j})^4 \quad (5)$$

The parameters of the rental function are chosen so that the elasticity of land supply is 0.25 initially, the reported relationship between forests and agriculture in the US (Hardie and Parks, 1997; Plantinga et al., 1999). This elasticity implies that the area of forests could increase by 0.25% if forests can pay an additional 1% rental payment per year. The same elasticity estimate is applied globally.

The stock of land in each forest type adjusts over time according to:

$$\begin{aligned} X_{a,t}^i &= X_{a-1,t-1}^i - H_{a-1,t-1}^i + G_{a=0,t-1}^i & i &= 1 - I \\ X_{a,t}^j &= X_{a-1,t-1}^j - H_{a-1,t-1}^j + N_{a=0,t-1}^j & j &= 1 - J \\ X_{a,t}^k &= X_{a-1,t-1}^k - H_{a-1,t-1}^k + G_{a=0,t-1}^k & k &= 1 - K \end{aligned} \quad (6)$$

Stocks of inaccessible forests in (k) are treated differently depending on whether they are in tropical or temperate/boreal regions. All inaccessible forests are assumed to regenerate naturally unless they are converted to agriculture. In tropical regions, forests often are converted to agriculture when harvested, so that $G_{a=0}^k$ is often 0 for tropical forests in initial periods when the opportunity costs of holding land in forests are high. As land is converted to agriculture in tropical regions, rental values for remaining forestland declines, and land eventually begins regenerating in forests in those regions. This regeneration is dependent on comparing the value of land in forests versus the rental value of holding those forests. In this study, we do not track the type of agriculture to which forests are converted, i.e. crops or grazing. Inaccessible forests in temperate/boreal regions that are harvested are converted to accessible timber types so that $G_{a=0}^k$ is set to 0. The stock of inaccessible forests is therefore declining over time if these stocks are being harvested. Each inaccessible boreal timber type has a corresponding accessible timber type in "I", and forests that are harvested in inaccessible forested areas in temperate/boreal regions are converted to these accessible types. Thus, for the corresponding timber type, we set $G_{a=0}^i \geq H_{a=1}^k$. Note that the area regenerated, $G_{a=0}^i$, can be greater than the area of the inaccessible timber type harvested because over time, harvests and regeneration occurs in forests of the accessible type.

Stocks of forest management are maintained as follows:

$$\begin{aligned} Z_{a,t}^i &= Z_{a-1,t-1}^i + m_{a=0,t-1}^i & i=1-I \\ Z_{a,t}^j &= Z_{a-1,t-1}^j + m_{a=0,t-1}^j & j=1-J \end{aligned}$$

The model is programmed into GAMS and solved in 10 year time increments. Terminal conditions are imposed on the system after 150 years. These conditions were imposed far enough into the future not to affect the study results over the period of interest. For the baseline case, tax policies are assumed to be consistent with current taxes. For the scenarios, taxes are assumed to differ.